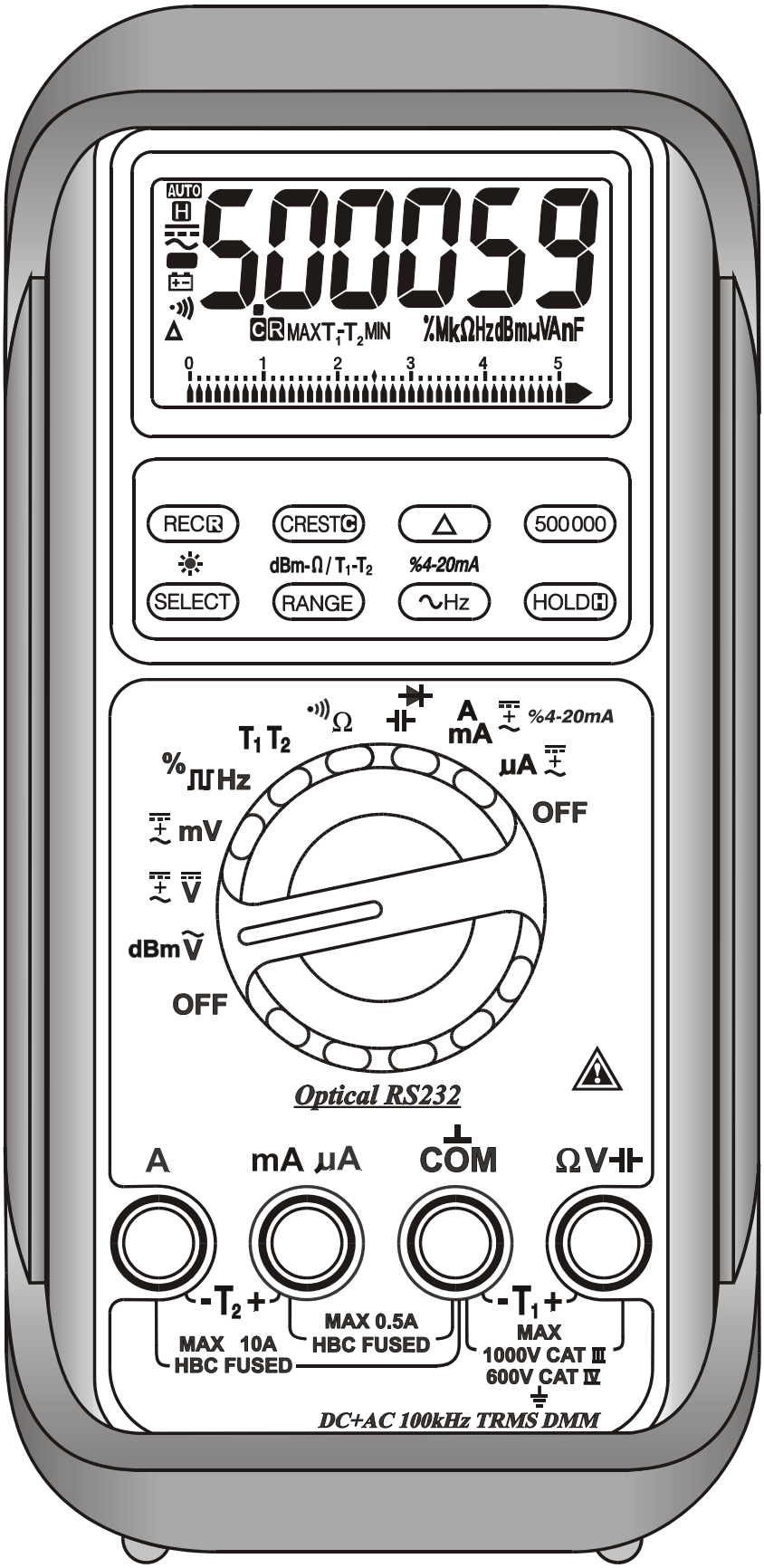


USER'S MANUAL

BM857
BM859CF

BRYMEN®
BRIGHT PEOPLE'S CHOICE

1) SAFETY

This manual contains information and warnings that must be followed for operating the instrument safely and maintaining the instrument in a safe operating condition. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. The meter is intended only for indoor use.

The meter is protected, against the users, by double insulation per EN61010-1 and IEC61010-1 2nd Edition (2001) to CAT III 1000V & CAT IV 600V. The meter also meets UL3111-1(1994)* and CSA C22.2 No. 1010-1-92* to CAT III 1000V.

BM857 Terminals (to COM) ratings:

V :	Category III 1000 Volts AC & DC, and Category IV* 600 Volts AC & DC.
A / mAμA :	Category III and Category IV* 500 Volts AC and 300 Volts DC.

BM859CF Terminals (to COM) ratings:

V / A :	Category III 1000 Volts AC & DC, and Category IV* 600 Volts AC & DC.
mAμA :	Category III and Category IV* 600 Volts AC and 300 Volts DC.

*Category IV safety standard (for DMMs) was first released in IEC61010-1 2nd Edition in year 2001, and was not adopted as an UL published standard at the time this manual was written.

Per IEC61010-1 2nd Ed. (2001) Measurement Category

OVERVOLTAGE CATEGORY II

Equipment of OVERVOLTAGE CATEGORY II is energy-consuming equipment to be supplied from the fixed installation.

Note – Examples include household, office, and laboratory appliances.

OVERVOLTAGE CATEGORY III

Equipment of OVERVOLTAGE CATEGORY III is equipment in fixed installations.

Note – Examples include switches in the fixed installation and some equipment for industrial use with permanent connection to the fixed installation.

OVERVOLTAGE CATEGORY IV

Equipment of OVERVOLTAGE CATEGORY IV is for use at the origin of the installation.

Note – Examples include electricity meters and primary over-current protection equipment.

TERMS IN THIS MANUAL

WARNING identifies conditions and actions that could result in serious injury or even death to the user.

CAUTION identifies conditions and actions that could cause damage or malfunction in the instrument.

WARNING

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. To avoid electrical shock hazard, observe the proper safety precautions when working with voltages above 60 VDC or 30 VAC rms. These voltage levels pose a potential shock hazard to the user. Do not touch test lead tips or the circuit being tested while power is applied to the circuit being measured. Keep your fingers behind the finger guards of the test leads during measurement. Inspect test leads, connectors, and probes for damaged insulation or exposed metal before using the instrument. If any defects are found, replace them immediately. Do not measure any current that exceeds the current rating of the protection fuse. Do not attempt a current measurement to any circuit where the open circuit voltage is above the protection fuse voltage rating. Suspected open circuit voltage should be checked with voltage functions. Never attempt a voltage measurement with the test lead inserted into the μA/mA or A input jack. Only replace the blown fuse with the proper rating as specified in this manual.

CAUTION

Disconnect the test leads from the test points before changing functions. Always set the instrument to the highest range and work downward for an unknown value when using manual ranging mode.

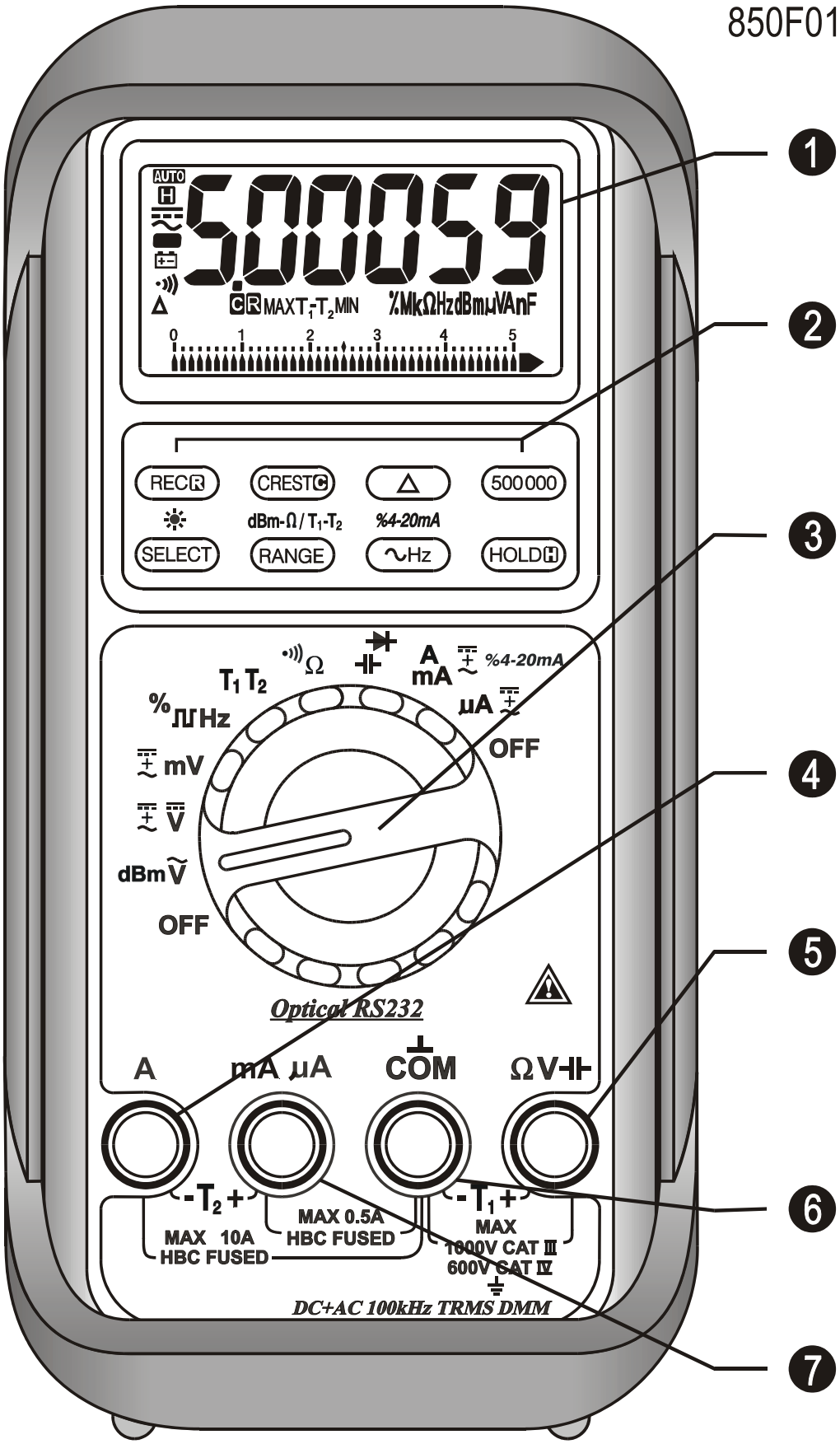
INTERNATIONAL ELECTRICAL SYMBOLS

⚠	Caution ! Refer to the explanation in this Manual
⚠	Caution ! Risk of electric shock
⏚	Earth (Ground)
⧈	Double Insulation or Reinforced insulation
▭	Fuse
~	AC--Alternating Current
⎓	DC--Direct Current

2) CENELEC Directives

The instruments conform to CENELEC Low-voltage directive 73/23/EEC and Electromagnetic compatibility directive 89/336/EEC

3) PRODUCT DESCRIPTION
Panel Illustration



1) 5-4/5 digits 500000 counts LCD display

2) Push-buttons for special functions & features

3) Selector to turn the Power On or Off and Select a function

4) Input Jack for 10A (+) (20A for 30sec) current, and for T2 (-) function

5) Input Jack (+) for all functions *EXCEPT current (μA, mA, A) and T2 functions*

6) Common (Ground reference) Input Jack (-) for all functions *EXCEPT T2 function*

7) Input Jack (+) for milli-amp, micro-amp, and T2 (+) functions

Average sensing RMS calibrated

RMS (Root-Mean-Square) is the term used to describe the effective or equivalent DC value of an AC signal. Most digital multimeters use average sensing RMS calibrated technique to measure RMS values of AC signals. This technique is to obtain the average value by rectifying and filtering the AC signal. The average value is then scaled upward (calibrated) to read the RMS value of a sine wave. In measuring pure sinusoidal waveform, this technique is fast, accurate, and cost effective. In measuring non-sinusoidal waveforms, however, significant errors can be introduced because of different scaling factors relating average to RMS values.

AC True RMS

AC True RMS, normally refers as True RMS, identifies a DMM function that is AC coupled, and responds accurately only to the effective RMS AC component value regardless of the waveforms. However, DC component plays an important role in the distorted non-symmetrical waveforms, and will also be of interest sometimes. A full wave rectified sine waveform is a good example, and the AC true RMS function will only give the AC component reading which is at 43.6% of the total effective DC+AC RMS reading.

DC+AC True RMS

DC+AC True RMS calculates both of the AC and DC components given by the expression $\sqrt{DC^2 + (AC\ rms)^2}$ when making measurement, and can responds accurately to the total effective RMS value regardless of the waveform. Distorted waveforms with the presence of DC components and harmonics may cause:

1) Overheated transformers, generators and motors to burn out faster than normal
2) Circuit breakers to trip prematurely
3) Fuses to blow
4) Neutrals to overheat due to the triplen harmonics present on the neutral
5) Bus bars and electrical panels to vibrate

AC Bandwidth

AC bandwidth of a DMM is the range of frequencies over which AC measurements can be made within the specified accuracy. It is not the frequency measurement function, and is the frequency response of the AC functions. A DMM cannot accurately measure the AC value with frequency spectrums beyond the AC bandwidth of the DMM. Therefore, wide AC bandwidth plays an important role in high performance DMM. In reality, complex waveforms, noise and distorted waveforms contain much higher frequency spectrum than its fundamental.

NMRR (Normal Mode Rejection Ratio)

NMRR is the DMM's ability to reject unwanted AC noise effect that can cause inaccurate DC measurements. NMRR is typically specified in terms of dB (decibel). This series has a NMRR specification of > 60dB at 50 and 60Hz, which is a good and definite ability to reject the effect of AC noise when making DC measurements.

CMRR (Common Mode Rejection Ratio)

Common mode voltage is voltage present on both the COM and VOLTAGE input terminals of a DMM, with respect to ground. CMRR is the DMM's ability to reject common mode voltage effect that can cause digit rattle or offset in voltage measurements. This series has a CMRR specifications of > 90dB at DC to 60Hz in ACV function; and > 120dB at DC, 50 and 60Hz in DCV function. If neither NMRR nor CMRR specification is specified, a DMM's performance will be uncertain.

Analog bar-graph

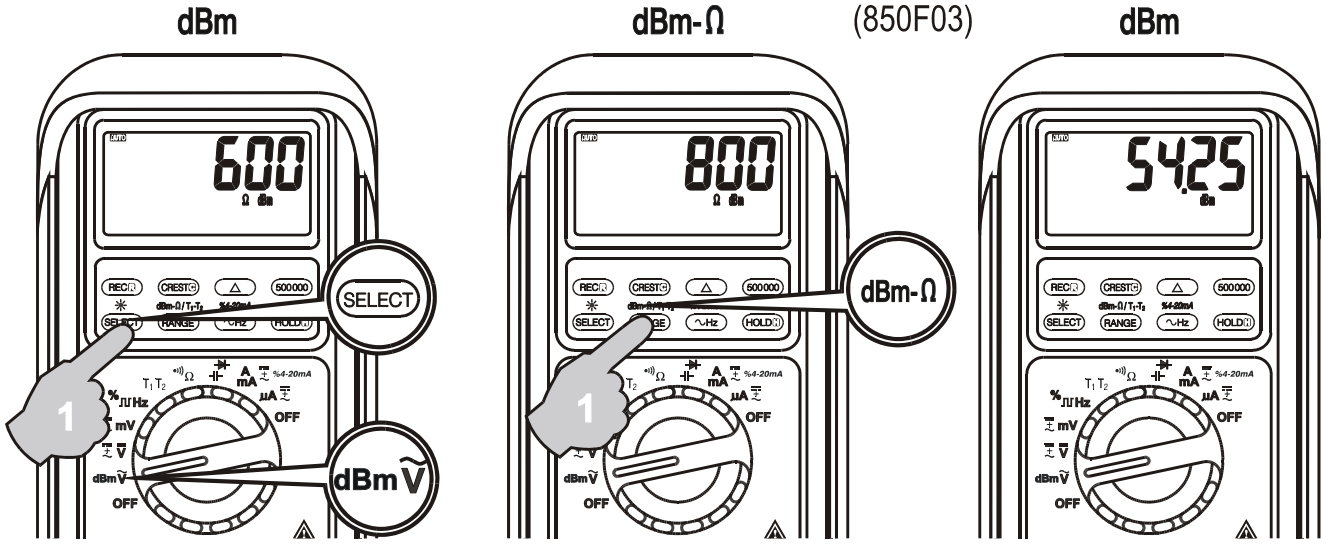
The analog bar graph provides a visual indication of measurement like a traditional analog meter needle. It is excellent in detecting faulty contacts, identifying potentiometer clicks, and indicating signal spikes during adjustments. Analog bar-graph is not available in AC+DC True RMS Voltage & Current modes.

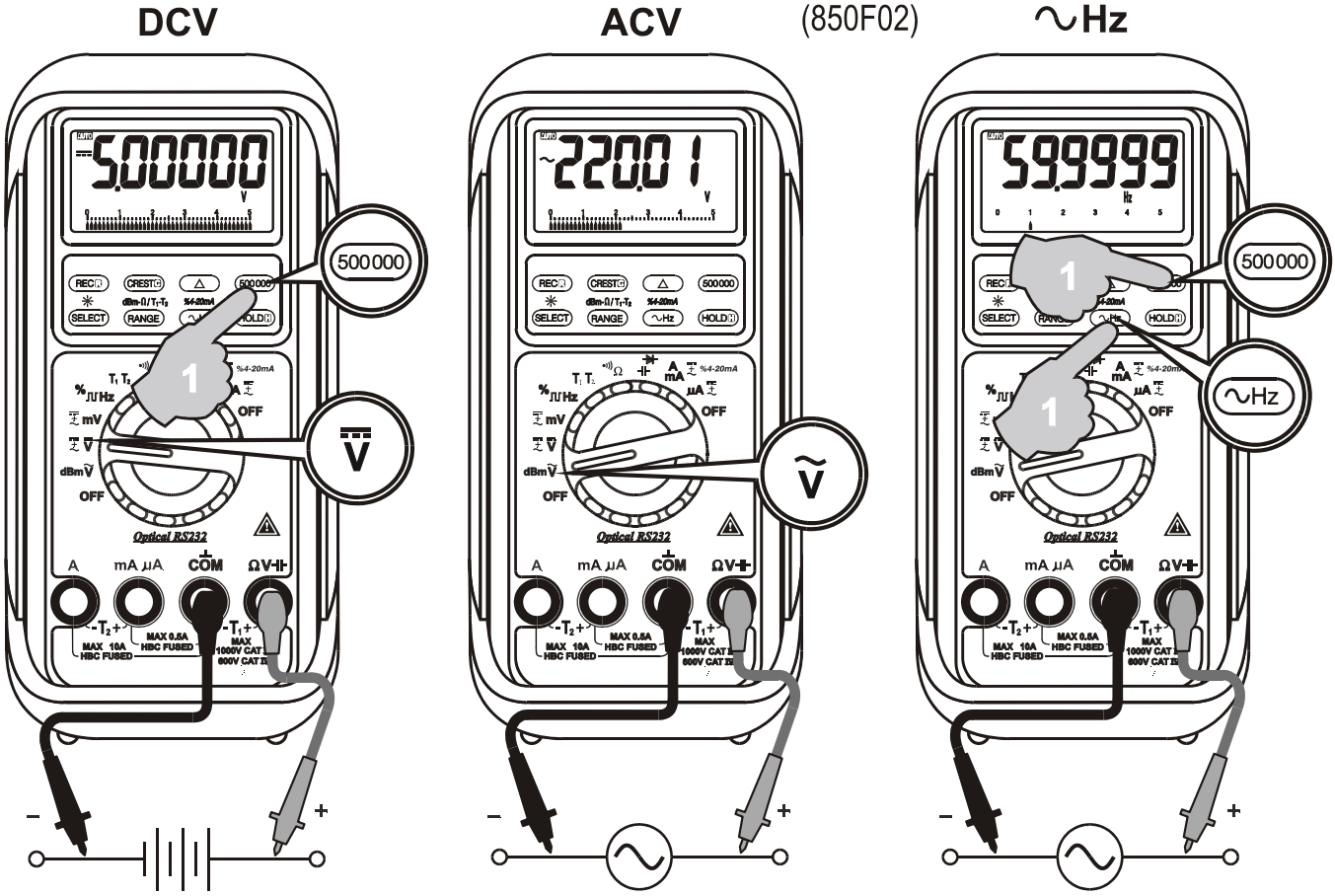
4) OPERATION

AC Voltage, DC Voltage, DC+AC Voltage, & ∿Hz Line Level Frequency

In AC Voltage, press **SELECT** button momentarily to toggle between AC and dBm. In DC Voltage, press **SELECT** button momentarily to toggle between DC, and DC+AC. In mV Voltage, press **SELECT** button momentarily to select DC, AC, or DC+AC. The new settings will be saved automatically to the non-volatile memory as power up default. In DCV and DCmV, press **500000** button momentarily to toggle between 4-4/5 digits and 5-4/5 digits readings. In voltage or current functions, press the **∿Hz** push button momentarily to activate or to exit Line Level Frequency measuring function. Line Level Frequency measuring function is designed especially for noisy electrical high voltage signals.

Note: In dBm function, power up default reference impedance will be displayed for 1 second before displaying the dBm readings. Press **dBm-Ω** (**RANGE**) button momentary to select different reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, up to 1200Ω. The new impedance value will be saved automatically to the non-volatile memory as power up default.

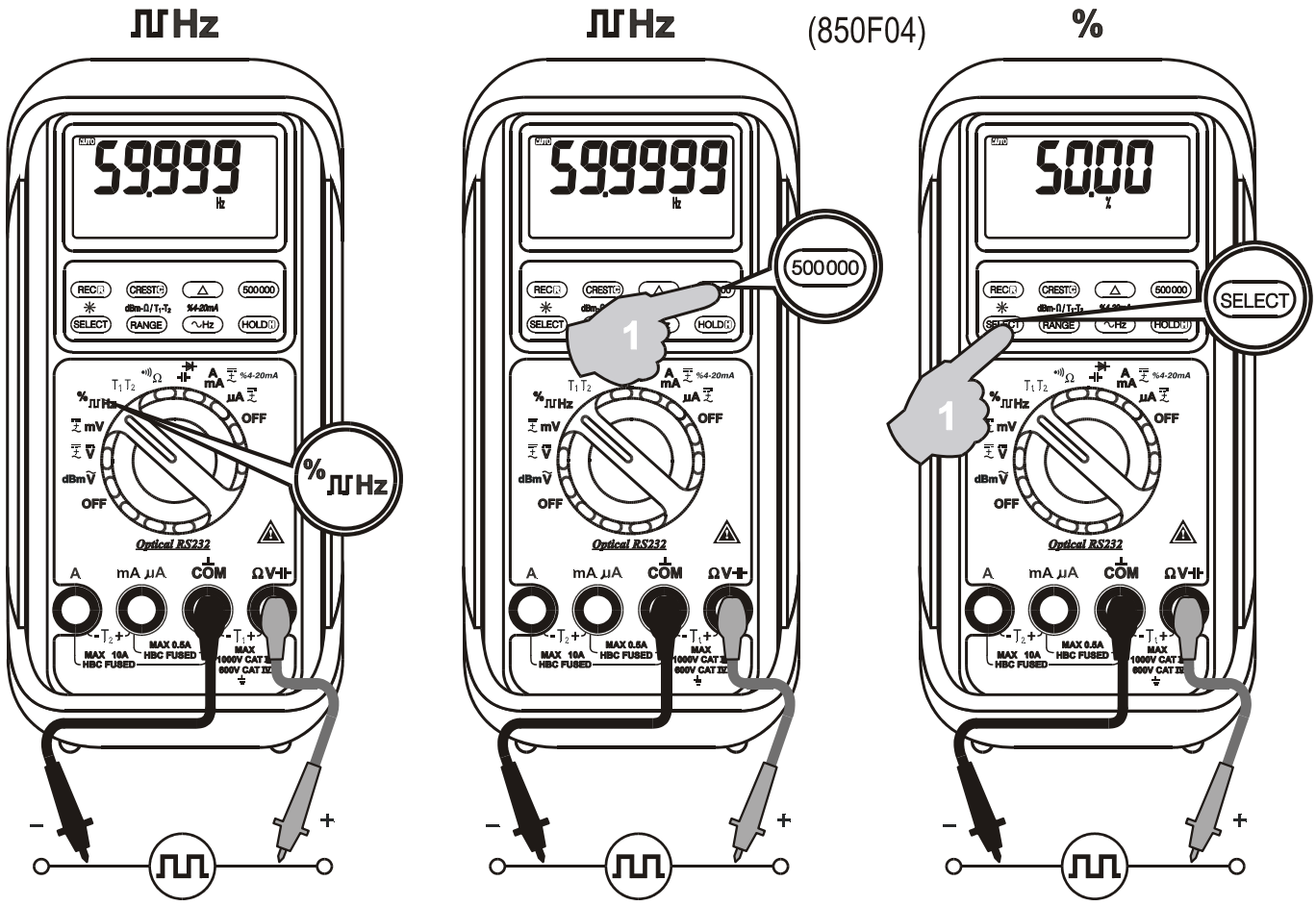




Note: Line Level Frequency measuring function input sensitivity varies automatically with voltage (or current) function range selected. The lower the measuring range the higher the sensitivity. That is, mV function has the highest and the 1000V range has the lowest as in voltage function ranges. It is recommended to first measure the signal voltage (or current) level then activate the Hz function in that voltage (or current) range to automatically get the most appropriate trigger level. When activated from voltage function, you can also press the **RANGE** button momentarily to select another trigger level range manually. The analog bargraph pointer will point at the selected trigger level range scale 1, 2, 3, or 4. If the Hz reading is unstable, select lower sensitivity to avoid electrical noise. If the reading shows zero, select higher sensitivity.

⎍⎍ Hz Logic Level Frequency and % Duty Cycle functions

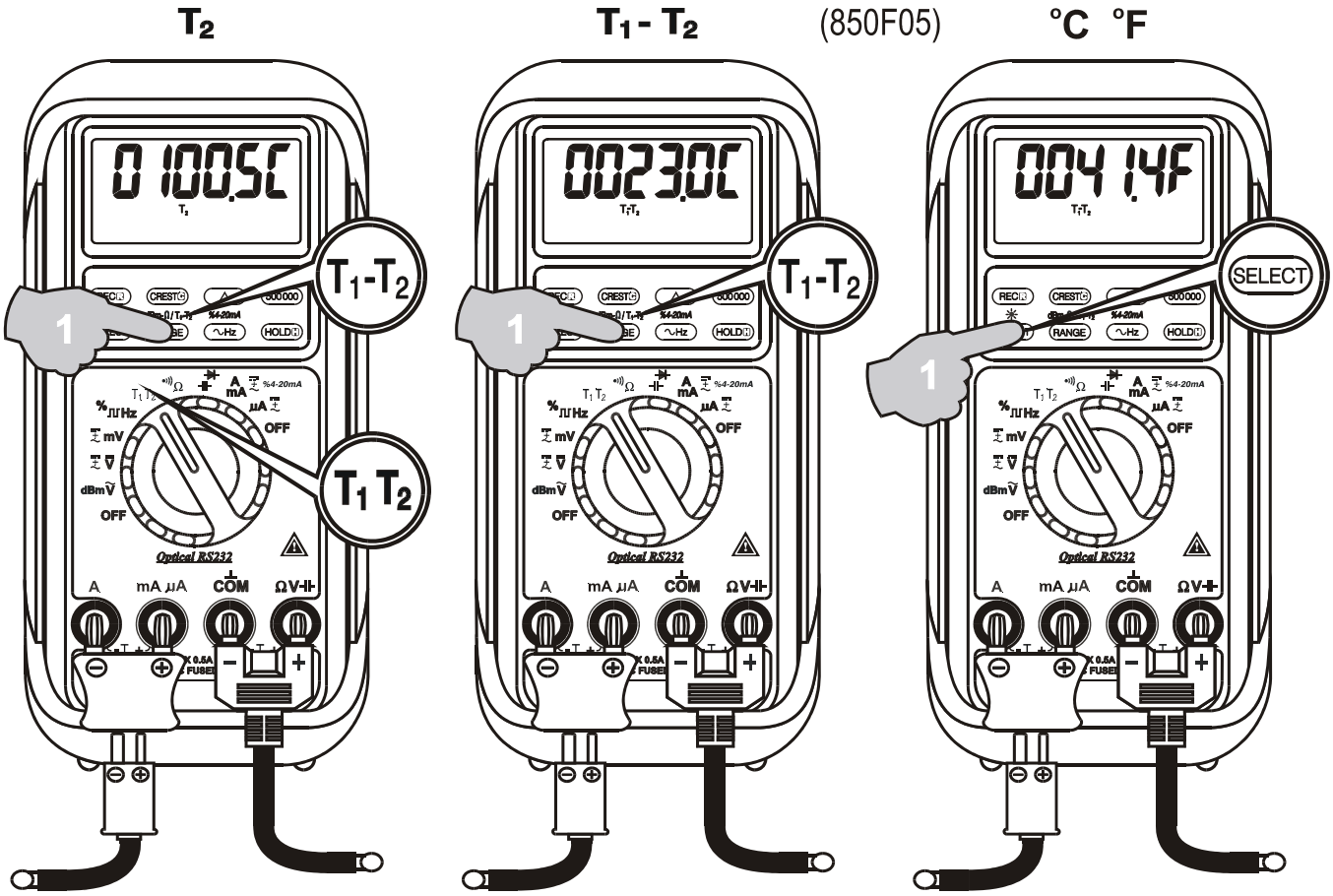
Press **SELECT** button momentarily to toggle between Hz and % (duty cycle) readings. The new setting will be saved automatically to the non-volatile memory as power up default. Press **500000** button momentarily to toggle between 5 full digits and 6 full digits Hz readings.



Note: Unlike the Line Level Frequency measuring function as previously stated, this Logic Level Frequency function is set only at the highest input sensitivity to measure digital type electronic signals.

T1-T2 Dual Channels Temperature function (BM859CF only)

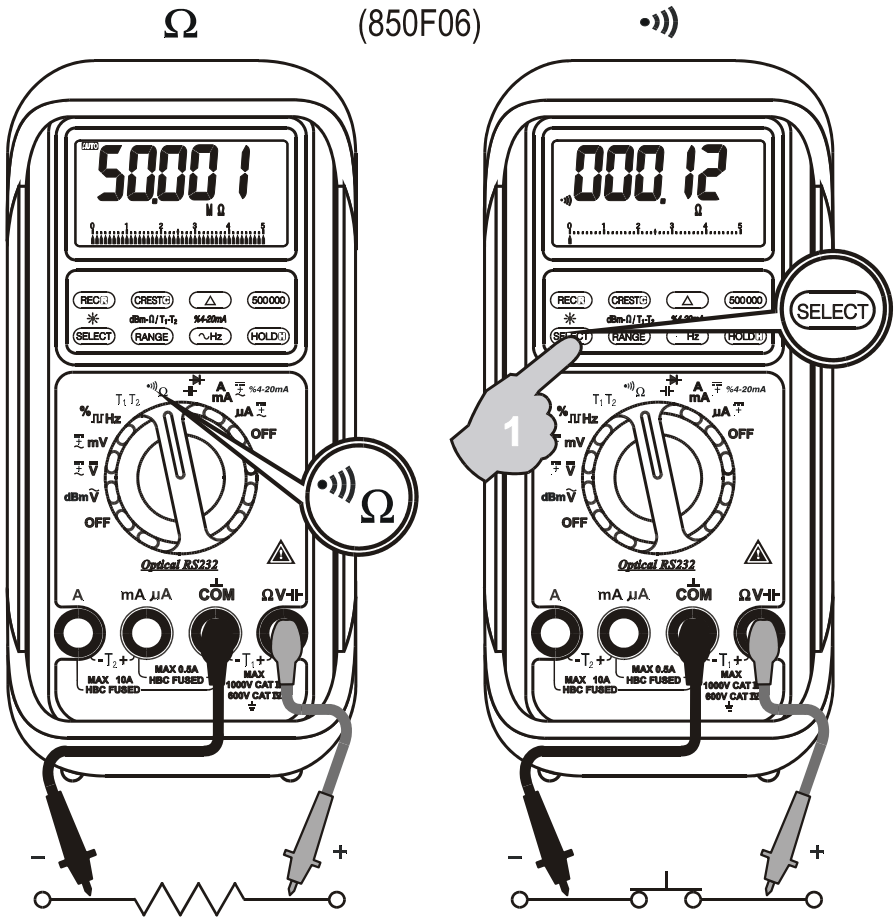
Press **SELECT** button momentarily to toggle between °C and °F readings, and the new setting will be saved automatically in the non-volatile memory as power up default. Press T1-T2 (**RANGE**) button momentarily to select T1, T2, or T1-T2 readings.



Note: Insert the banana plug K-type temperature bead probe Bkp60 (standard accessory x 1) with correct **+ −** polarities. Dual channels T1-T2 readings require 2 probes. You can also use a plug adapter Bkb32 (Optional purchase) with banana pins to K-type socket to adapt other standard K type mini plug temperature probes.

Ω Resistance, •)) Continuity functions

Press **SELECT** button momentarily to toggle between Ω and •)) Continuity functions. The new setting will be saved automatically to the non-volatile memory as power up default. Continuity function is convenient for checking wiring connections and operation of switches. A continuous beep tone indicates a complete wire.



CAUTION

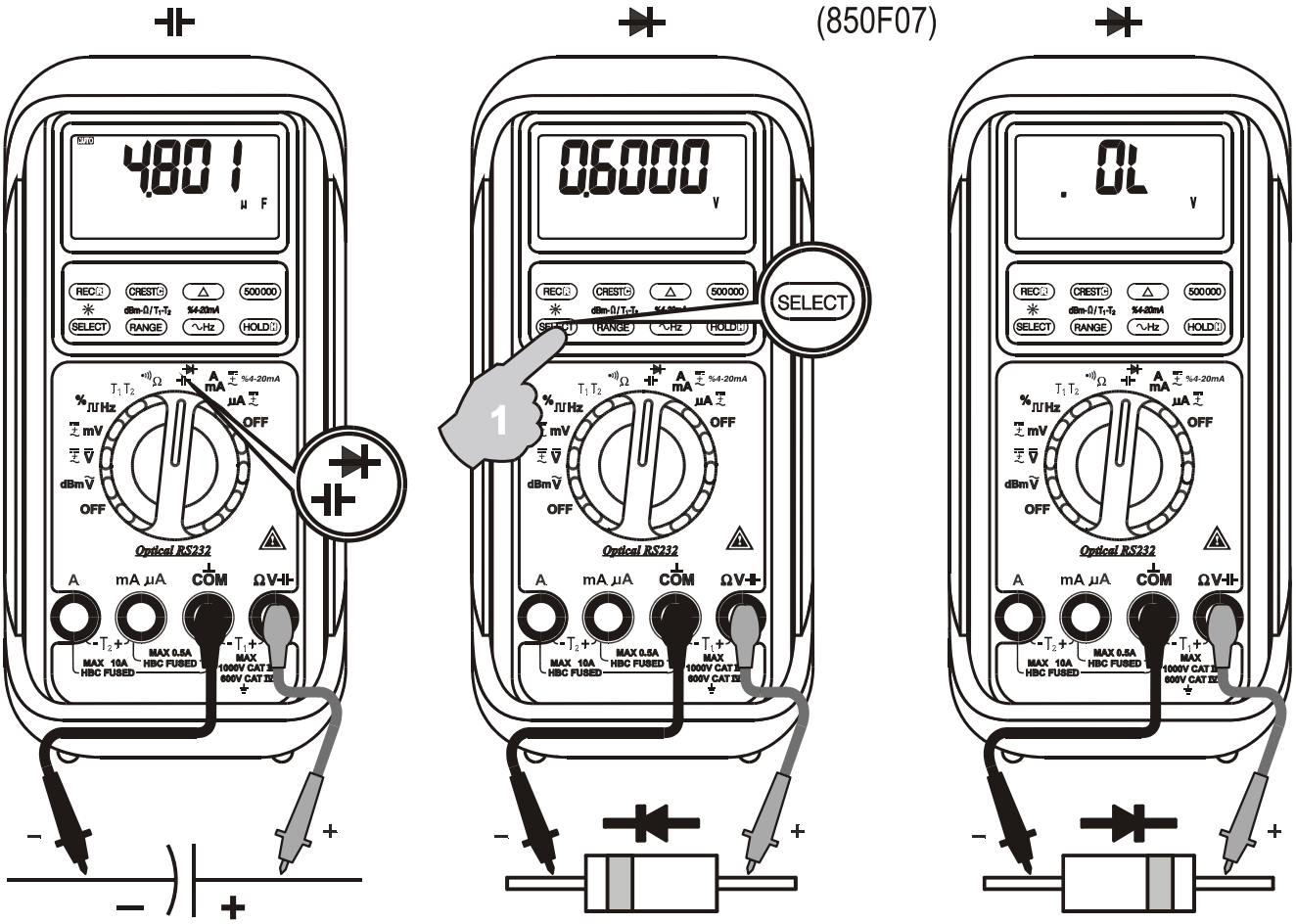
Using resistance or continuity function in a live circuit will produce false results and may damage the meter. In many cases the suspected component must be disconnected from the circuit to obtain an accurate reading.

⊣⊢ Capacitance, ⊣▶⊢ Diode test function

Press **SELECT** button momentarily to toggle between ⊣⊢ Capacitance and ⊣▶⊢ Diode test functions. The new setting will be saved automatically to the non-volatile memory as power up default.

CAUTION

Discharge capacitors before making any measurement. Large value capacitors should be discharged through an appropriate resistance load.

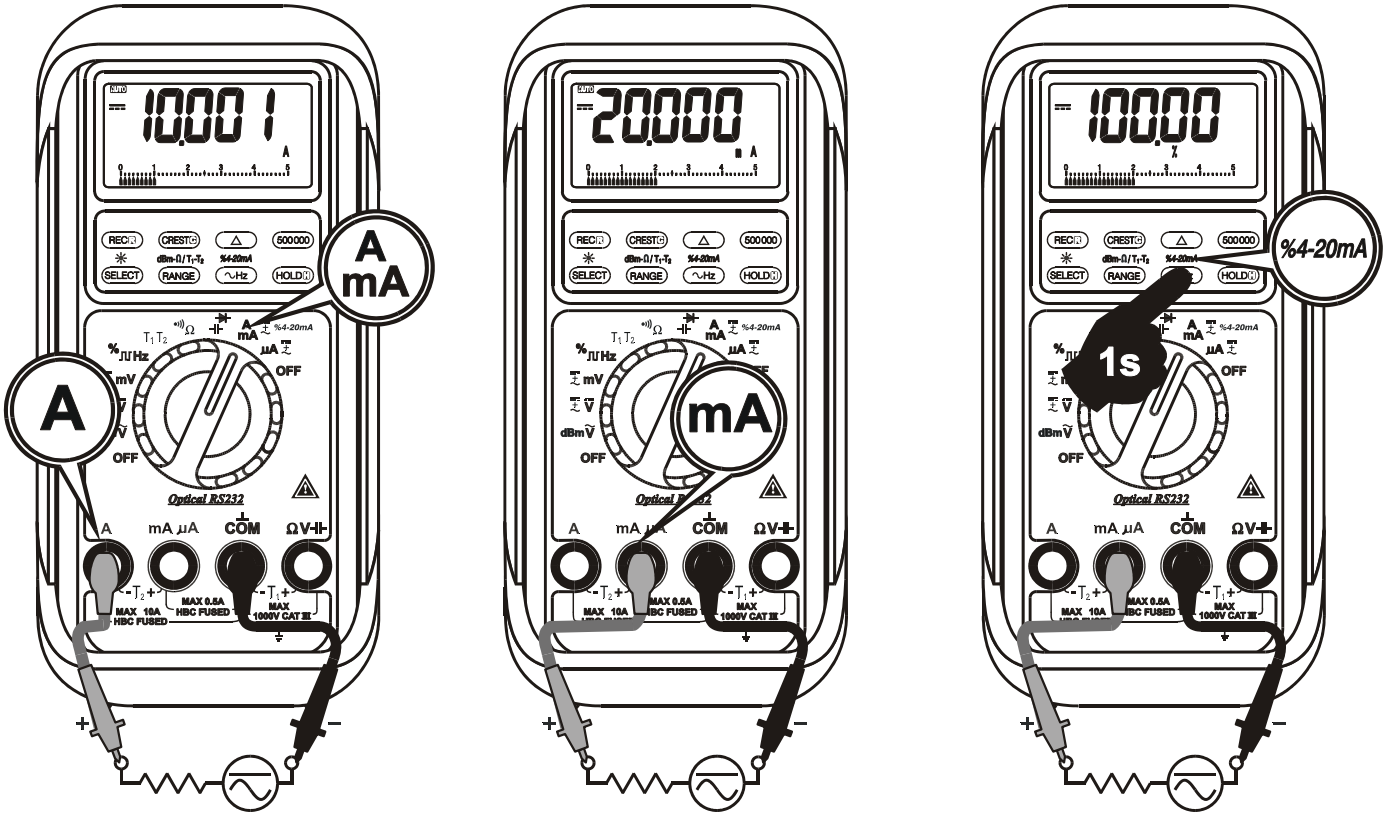


Note: Normal forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

μA, mA, A, and %4-20mA Current functions

Insert the red test lead into the correct μA/mA or A input jack. Press **SELECT** button momentarily to select DC, AC, or DC+AC. The new settings will be saved automatically to the non-volatile memory as power up default. In DC mA function, neither in AC nor in DC+AC, *press and hold* the **%4-20mA** (**∿Hz**) button for 1 second or more to display the current digital data in terms of loop current percentage (%) value. It is set at 4mA = 0% (zero) and 20mA = 100% (span) with 0.01% high resolution, which virtually extends the meters' capability to test and regulate the externally powered loop current in the industrial process control applications. The analog bar-graph remains the mA current value to alert the user.

A **mA** (850F08) **%4-20mA**



Warning: When measuring a 3-phase system, special attention should be taken to the phase to phase voltage which is significantly higher than the phase to earth voltage. To avoid exceeding the voltage rating of the protection fuse(s) accidentally, always consider the phase to phase voltage as the working voltage for the protection fuse(s).

RS232C PC computer interface capabilities

The instrument equips with an optical isolated interface port at the meter back for data communication. Optional purchase PC interface kit BR85X (BC85X RS232C optical adapter cable + BS85X RS232C software floppies) is required to connect the meter to the PC computer. The BS85X RS232C Data Recording System software equips with a digital meter, an analog meter, a comparator meter, and a Data Graphical recorder display. Refer to the README file in the interface kit for further details.

MAX/MIN RECORDING mode

Press **REC** button momentarily to activate MAX/MIN recording mode. The LCD annunciators “R” and “MAX MIN” turn on. The meter beeps when new maximum or minimum reading is updated. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), and Maximum minus Minimum (MAX-MIN) readings. Press the button for 1 second or more to exit MAX/MIN recording mode. Auto Power Off feature will be disabled automatically in this mode.

CREST Capture (Instantaneous Peak Hold) mode

Press **CREST** button momentarily to activate CREST mode to capture voltage or current signal duration as short as 0.8ms. This mode is available in DC, AC, DC+AC modes of voltage and current functions. The LCD annunciators “C” & “MAX” turn on. The meter beeps when new maximum or minimum reading is updated. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), and Maximum minus Minimum (MAX-MIN) readings. Press the button for 1 second or more to exit CREST capture mode. Auto Power Off feature will be disabled automatically in this mode.

△ Relative Zero mode

Relative Zero allows the user to offset the meter consecutive measurements with the displaying reading as the reference value. Practically MAX/MIN recording feature readings can also be set as relative reference value. Press the △ button momentarily to activate and to exit Relative Zero mode.

500000 high resolution stable mode

In DC voltage and frequency functions, press the **500000** button momentarily to toggle between the 4-4/5 digits fast mode and the 5-4/5 digits high resolution stable mode.

Backlighted display

Press the **SELECT** button for 1 second or more to turn on or off the display backlight function. It will also be turned off automatically after 30 seconds to extend battery life.

Manual or Auto-ranging

Press the **RANGE** button momentarily to select manual-ranging mode, and the meter will remain in the range it was in, the LCD annunciator AUTO turns off. Press the button momentarily again to step through the ranges. Press and hold the button for 1 second or more to resume auto-ranging mode.

Note: Manual ranging mode feature is not available in Hz function.

Hold

The hold function freezes the display for later view. Press the **HOLD** button momentarily to activate or to exit the hold function.

Set Beeper Off

Press the **Hz** button while turning the meter on to disable the push button operating beeper feature. However, the continuity and Jack Beep input warning features remain.

Intelligent Auto Power Off (APO)

The Intelligent Auto Power Off (APO) mode turns the meter off automatically to extend battery life after approximately 17 minutes of no activities. Activities are specified as: 1) Rotary switch or push button operations, and 2) Significant measuring readings of above 10% of range or non-OL Ω readings. In other words, the meter will intelligently avoid entering the APO mode when it is under normal measurements. To wake up the meter from APO, press the **RECORD** button momentarily or turn the rotary switch to the OFF position and then turn back on again. Always turn the rotary switch to the OFF position when the meter is not in use.

Disabling Auto Power Off

Press the **RANGE** button while turning the meter on to disable the Auto Power Off (APO) feature.

5) MAINTENANCE

WARNING

To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case. Do not operate with open case. Install only the same type of fuse or equivalent

Trouble Shooting

If the instrument fails to operate, check battery, fuses, leads, etc., and replace as necessary. Double check operating procedure as described in this user's manual. If the instrument voltage-resistance input terminal has subjected to high voltage transient (caused by lightning or switching surge to the system) by accident or abnormal conditions of operation, the series fusible resistors will be blown off (become high impedance) like fuses to protect the user and the instrument. Most measuring functions through this terminal will then be open circuit. The series fusible resistors and the spark gaps should then be replaced by qualified technician. Refer to the LIMITED WARRANTY section for obtaining warranty or repairing service.

Cleaning and Storage

Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for periods of longer than 60 days, remove the battery and store it separately.

Battery and Fuse replacement

Battery use:

9V alkaline battery NEDA1604A, JIS6AM6 or IEC6LF22

BM857:

Fuse (FS1) for μAmA current input: 0.63A/500V, IR 200kA, F fuse;

Fuse (FS2) for A current input: 12.5A/500V, IR 20kA, F fuse

BM859CF:

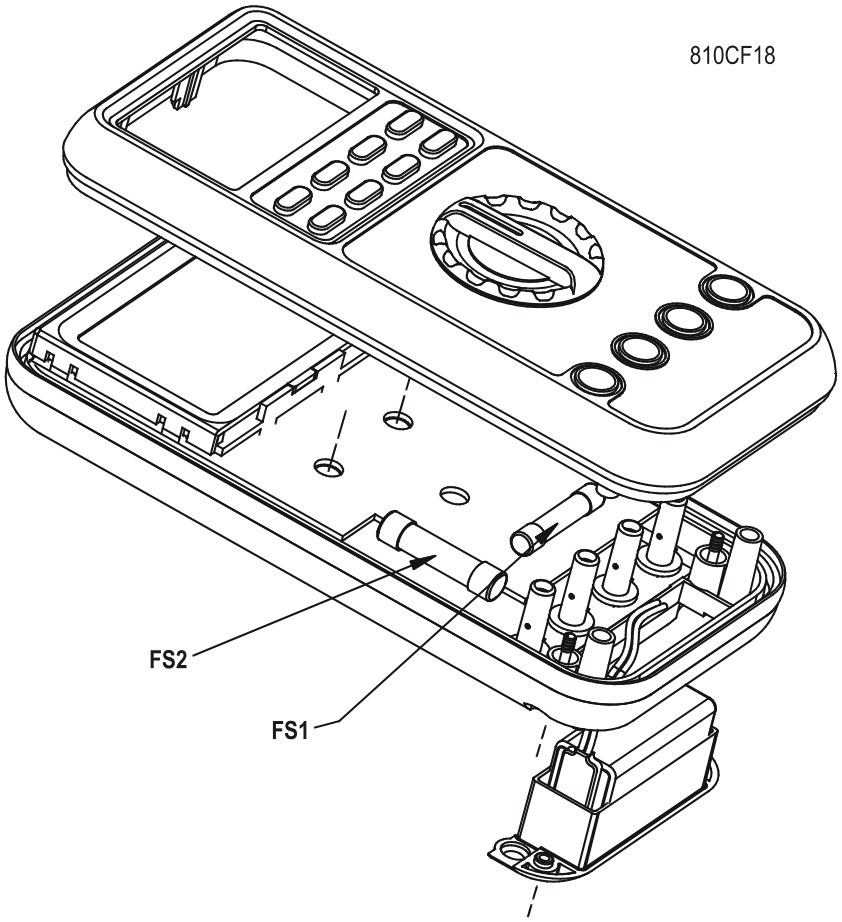
Fuse (FS1) for μAmA current input: 1A/600V, IR 100kA, F fuse

Fuse (FS2) for A current input: 15A/1kV, IR 10kA (or 11A/1kV, IR 20kA), F fuse

*The 0.44A fuse is also recommended since it has a Time-Current Characteristic Curves projection of approaching infinity at 0.5A. It can also be loaded way beyond 1000 seconds at 1A, and has a fast acting characteristic of below 0.01 second at beyond 2.5A. This protection characteristic also matches our meter nicely.

Battery replacement for models with battery access door:

Loosen the 2 screws from the battery access door of the case bottom. Lift the battery access door and thus the battery compartment up. Replace the battery. Re-fasten the screws.



Fuse replacement (and also Battery replacement for splash proof version without battery access door):

Loosen the 4 screws from the case bottom. Lift the end of the case bottom nearest the input jacks until it unsnaps from the case top. Replace the blown fuse(s) and/or the battery. Replace the case bottom, and ensure that all the gaskets are properly seated and the two snaps on the case top (near the LCD side) are engaged. Re-fasten the screws.

LIMITED WARRANTY

BRYMEN warrants to the original product purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service within a period of one year from the date of purchase. BRYMEN's warranty does not apply to accessories, fuses, fusible resistors, spark gaps, batteries or any product which, in BRYMEN's opinion, has been misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling.

To obtain warranty service, contact your nearest BRYMEN authorized agent or send the product, with proof of purchase and description of the difficulty, postage and insurance prepaid, to BRYMEN TECHNOLOGY CORPORATION. BRYMEN assumes no risk for damage in transit. BRYMEN will, at its option, repair or replace the defective product free of charge. However, if BRYMEN determines that the failure was caused by misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling, you will be billed for the repair.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE. BRYMEN WILL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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